

# Comparative Analysis on Perception of the Earth's Shape between Islamic Studies and Muslim Geography Students, Kashim Ibrahim University, Maiduguri, Borno State

By

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## Abstract

*This study was a comparative analysis of the perception of the Earth's shape between Muslim Students from Geography and Islamic Studies Departments, Kashim Ibrahim University, Maiduguri, Borno State. The study was aimed at determining if there was any significant difference on the perception of the Earth's shape between students of the two departments as a result of variations in their discipline. 108 students were randomly selected from the two departments and administered structured questionnaire. Null and alternative hypotheses were formulated for the study. The results gave a calculated  $\chi^2$  value of 10.58 which was bigger than the table value of 3.841. The null hypothesis was, therefore, rejected and an alternative hypothesis which stated that there was a significant difference on the perception of shape of the Earth between students of the two departments was accepted. The result showed that Muslim students studying geography have a better perception on the spherical shape of the Earth. This underscores the need to integrate science and religion. The study, therefore, recommended that knowledge of geography, particularly related to the evidences of sphericity of the Earth, is very vital for students and scholars of Islamic studies in understanding and interpreting verses or phenomena related to the shape of the Earth.*

**Keywords:** Perception, Geography, Qur'an, Earth's shape, Spherical, Phenomenological Language

## Introduction

A comparative analysis on the perception of the shape of the Earth between Muslim students from geography and Islamic studies departments is a prime example of where geographical and religious interpretations can lead to both distinct and surprisingly convergent views.

The determination of the Earth's shape is one of the oldest intellectual pursuits of humanity, serving as a cornerstone for both physical sciences and theological reflection. In the modern academic landscape, the perception of this planetary form (Earth) is mediated through distinct disciplinary lenses (Lesley, 2015 & Tzortzis, 2021).

This study seeks to compare if there is variation on the perceptions of the Earth's shape between students from the two distinct academic departments. While both groups for this study exist within the same contemporary educational framework of the Kashim Ibrahim University and largely sharing the same physical and non-physical environments, their academic organizational structures or faculties are different. Therefore, their understanding and interpretation of physical reality is often pursued through different epistemologies as a result of the variation in their sub-sociocultural environment – geography is rooted in empirical measurement and Islamic studies in scriptural interpretation and historical tradition. According to Lipton, (2018), in a book named “Rethinking Ibn Arabi”, despite the differing

methodological approach, the Qur'an and geography have convergent views because the former contains multiple layers of meaning that unfold with advancement in human knowledge which was expounded by Ibn Arabi about 800 years ago. Inasmuch as integration is done through research and in-depth analysis, the two distinct fields (geography and Islam) are complementary.

For students of Geography, the shape of the Earth is an axiom of their discipline. Grounded in scientific method, their perception is shaped by Geodesy – the science of accurately measuring and understanding the Earth's geometric shape, orientation in space, and gravity field. To a geography student, the Earth is defined as an oblate spheroid or a geoid, a conclusion derived from observable data, satellite imagery, physics, and mathematical modeling. Other evidences offered by geographers as proof of the Earth's sphericity include circumnavigation of the Earth, ship's visibility at harbour, global variations in sunset and sunrise, shape of shadow of the Earth seen during lunar eclipse, circular horizon seen on high objects or lands, space photographs and analogical deduction because other planets or heavenly bodies are visibly spherical. The acceptance of the Earth's sphericity is not merely a belief but a necessary prerequisite for understanding cartography, climate systems, and global navigation (Afrizah & Novitri, 2024).

Conversely, students of Islamic Studies approach the shape of the Earth through the lens of religious revelation. Their perception is informed by the Qur'an, the Prophetic traditions, and the extensive legacy of Islamic astronomy. Historically, Islamic scholarship, spearheaded by polymaths like Al-Biruni and Ibn Hazm, who championed the concept of a spherical Earth long before the European Renaissance, driven by the religious necessity of determining the Qibla (direction of prayer). For the contemporary Islamic Studies student, the spherical shape of the Earth is often perceived as a scientific truth that affirms the Qur'an, supported by linguistic interpretations of verses describing the "wrapping" (takwir) of night and day. Here, the authority is the text, interpreted through the consensus of scholars (Saad, 2024).

In Nigeria, particularly Borno state, there is still the need to address some issues related to geographic thought which ironically play a part in the failure of accepting geographical knowledge, or education in general by some members of the society. This resurgence of religious fundamentalism and dissenting voice has sparked tensions, as dogmatic viewpoints clash with evidence-based science leading to years of conflict and stagnation in development which are manifest in the ideologies that often turn into deadly terror groups (Pisa and Tim, 2015). Members of such terror groups are notorious in openly preaching against Western education by misinterpreting the Qur'an to back up their claim that Islam and the science, particularly of geography, are parallel. To such groups, any interpretation that does not fit into their perception should be rejected even through violent means or armed conflict (Kassim & Nwankpa 2019 & Duodu, 2009).

The above situation is what informed the choice of comparing the perceptions of the students from the two departments selected because understanding these distinct perceptions is vital for developing integrated curricula that respect religious heritage while promoting scientific literacy.

## Literature Review

### The Shape of the Earth: Divergence and Convergence of Views

The Earth is spherical in shape. It is bulgy at the equator and slightly flattened at the poles. For this reason, the Earth's shape is appropriately described as an oblate spheroid. Today, advancement in science and technology has made this fact very glaring (Ali & Musfiroh, 2024).

As early as the 6<sup>th</sup> and the 5<sup>th</sup> centuries BC, Pythagoras and Parmenides respectively postulated that the Earth is spherical (Lesley 2015). Aristotle by 330 BC on the basis of physical theory and observational evidence provided some facts that the Earth is indeed spherical. He made an attempt to measure its circumference (Ragep, 2022). The Earth's circumference was later determined with outstanding accuracy around 240 BC by another Greek scholar – Eratosthenes. According to Ofomata (2001), Greek scholarship took its roots from the work of Egyptian scholars but the Greeks were foremost in documenting their successes. Thus, Edward (2007) stated that, it is clear that through the Greeks the natural explanations for the universe was set into motion based on scientific method through inquiry and observation.

Aided by translations of Greek texts, the scientific worldview was preserved and absorbed into the Arabic-speaking Muslim world. The recovery and assimilation of Greek work and Islamic inquiries were later extended into Western Europe from the 10th to 13th century which revived the learning of natural philosophy in the West (Lindberg, 2007 & Ofer, 2021).

Nonetheless, not everybody believes that the Earth is spherical. Flat Earth, on the contrary, is an archaic and scientifically disproven conception of the Earth's shape based on many ancient cultures who subscribed to a flat-Earth model (Dunning, 2023). Scientists and researchers studying the phenomenon often emphasize the importance of improving scientific literacy and encouraging critical thinking to counter misinformation. Even in the developed worlds like the USA, a study by Hamilton (2021) indicated that about 10% of 1,134 adults sampled in the United States genuinely believed that the Earth is flat citing religious references for their belief but without imposing their perception on anybody.

In the Islamic World, Anchassi (2022) opined that, prior to the introduction of Greek cosmology Muslims tended to view the Earth as flat, and Muslim traditionalists who rejected Greek philosophy continued to hold to this view while various theologians held opposing opinions. Similarly, James (2023) also maintained that, it is from the 10th century onwards that Muslim traditionalists began to adopt the notion of a spherical Earth through the influence of Greek and Ptolemaic cosmology.

The relationship between science and religion has been variously characterized in terms of "conflict", "harmony", and "complementary" among others. Events in Europe such as the conviction of Galileo, of heresy, for believing the heliocentric model in the early 17th century led Draper to postulate a conflict thesis, suggesting that religion and science have been in conflict methodologically, factually and politically throughout history. However, the "conflict thesis" has since lost its general favour (Russel, 2002). In contrast to the conflict thesis, Thomas Aquinas believes that faith and reason complement rather than contradict each other which led him to postulate the complementary theory. Aquinas is of the opinion that discrepancy between faith and reason arises from a shortcoming of either natural science or scriptural interpretation (Beattie, 2012). This viewpoint is also shared by Lipton (2018) and (Ali & Musfiroh, 2024).

The Qur'an, however, does not explicitly state that the Earth is a sphere or flat, but it uses language in several verses that has been subjected to various interpretations regarding its shape. Although, Islamic scholars are renowned for preserving and translating Greek work which played a vital role in achieving "Renaissance" and recovery from the "Dark Age" (Warren, 2004), yet there are conflicting views regarding acceptance of science in some quarters. Tyabo, (2007) has observed that some students used to show total unacceptability to some geographical concepts. He disclosed this in the preface of his book titled, 'Elements of Geography: An Islamic Perspective' published to show the complementary aspect of Islam and geography. Whereas, it cannot be denied that some scholars, in the past and of recent have expressed ideas like flat and motionless earth, which contradict modern science, many Muslim scholars, on the other hand, have sided with science and encouraged its pursuit.

There is the need to analyse the root causes of conflicts in order to identify appropriate solutions. This approach is effective in systematically preventing and addressing underlying issues rather than just treating symptoms through palliative treatment. This study, therefore, compared the perception of Muslim Geography Students (MGS) with that of Islamic Studies (ISS) in the Kashim Ibrahim University, Maiduguri, Borno state, regarding the spherical shape of the Earth to find out if there is variation in their perception and recommend how to remedy them.

### **Material and Methods**

This study was conducted at Kashim Ibrahim University, Maiduguri, Borno state. Primary data were collected using structured questionnaire administered to 54 students randomly selected from the 300 and 400 levels of the Department of Islamic Studies. The same number (54) were randomly selected among the Muslim students from Department of Geography making a total of one hundred and eight (108) respondents. The information generated from the questionnaire included gender, age, current course level and whether they had studied geography at secondary school level. The research question for the study was: (i) Do you agree that the Earth is spherical, that is, round in shape? The use of a single question is validated and ensured reliable by Missanin and Hinderlite (1991). They are also of the opinion that the sampled population should be more than 50 so that chi-square test would be used without resorting to Fishers' exact test. The two groups (departments), therefore, were the independent variable (categorical) while responses of either 'yes' or 'no' on the questionnaire were the dependent variable (outcome variable). As the data were in form of frequency counts with mutually exclusive options, chi-square ( $\chi^2$ ) which is a non-parametric statistical test was used to analyse the nominal data of 1 *df* at 0.05 level of significance. Null and alternative hypotheses were formulated for the test. Excel (Spreadsheet) was used in calculating the expected outcomes and the p-value as well as in plotting the chart.

### **Results and Discussion**

#### **The demographic characteristics**

All the 108 sampled respondents are Muslims. Therefore, it is expected that geography students having integrated Islam with science of geography would have a better perception regarding the shape of the Earth.

The gender of the respondents showed that only 13% of the respondents from Department of Geography are female. The remaining 87% are males. An indication that females, generally,

do not prefer a course that has to do with outdoor activities like fieldwork. However, such field studies often give students better opportunity to understand the true shape of the Earth through simple outdoor demonstrations during fieldwork. In the Department of Islamic Studies about 37% are females while the remaining 63% are males (table 1).

**Table 1: Gender Characteristics of the Respondents**

Gender	MGS	%	ISS	%	%
Male	47	87.037	34	62.96296	81
Female	7	12.963	20	37.03704	27
<b>Total</b>	<b>54</b>		<b>54</b>		<b>108</b>

Majority of the respondents (81%) are within the age range of 21 – 30 years. 13% were within the range of 31 – 40 years. 4% were less than 20 years and 3% were above 41 years of age (table 2). As 97% of the respondents are above the teenage age, according to Baldy (2023) and Jelinek (2024), it is expected that they would have a better perception of the shape of the Earth as spherical.

**Table 2: Age Characteristics of the Respondents**

Age	MGS	%	ISS	%	Total	%
<20	1	1.85185	3	5.555556	4	3.703704
21 - 30	46	85.1852	41	75.92593	87	80.55556
31 – 40	7	12.963	7	12.96296	14	12.96296
>41	0	0	3	5.555556	3	2.777778
<b>Total</b>	<b>54</b>	<b>100</b>	<b>54</b>	<b>100</b>	<b>108</b>	<b>100</b>

**The Formulated Hypotheses**

The following null and alternative hypotheses were formulated for the study:

H<sub>0</sub>: There is no significant difference on the perception of shape of the Earth as spherical between Muslim geography students and Islamic studies students from the Kashim Ibrahim University Maiduguri, Borno state.

H<sub>1</sub>: There is a significant difference on the perception of shape of the Earth as spherical between Muslim geography students and Islamic studies students from the Kashim Ibrahim University Maiduguri, Borno state.

The Observed frequency (O) is derived from the responses of the students while Expected outcomes (E) were computed using Excel (Spreadsheet) and presented in table 3 and Fig. 1 below.

Variables	Agree		Disagree		Total
	O	E	O	E	
Muslim Geography Students	53	47.5	1	6.5	54
Islamic Studies Students	42	47.5	12	6.5	54
<b>Total</b>	<b>95</b>		<b>13</b>		<b>108</b>

$$df = (C - 1) (R - 1) = 1$$

Expected outcome (E) = (Row total x Column total)/Grand total

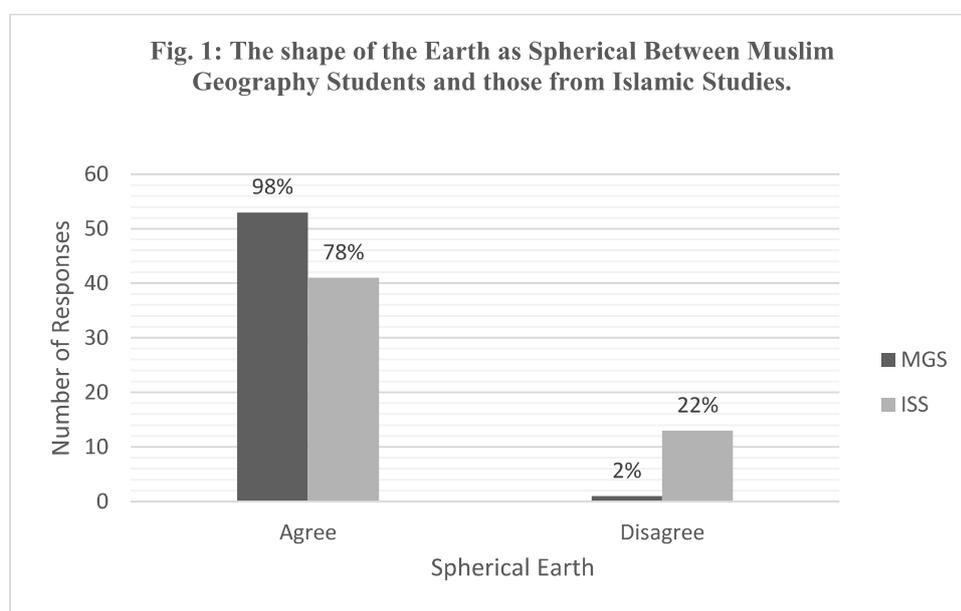
$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

E

$\chi^2$  of 1 *df* at 0.005 alpha level of significance is 3.841 which was used to find out whether what was observed had significant difference from what was expected. The calculated value obtained is 10.58 which is bigger than the table (critical) value (3.841). The null hypothesis is therefore rejected and the alternative hypothesis which stated that: there is a significant difference in the perception of the shape of the Earth as spherical between Muslim geography students and Islamic studies students from the Kashim Ibrahim University Maiduguri, Borno state is accepted. The result of the p-value calculated is 0.001142 which is quite less than the 0.05 significance level (alpha). This implies that the observed relationship or difference between the perceptions of the students from the two departments is unlikely to be due to random chance alone and there is, therefore, evidence to support the alternative hypothesis. This underscores the need to integrate religion and geography to have a bigger picture of the shape of the Earth.

### Discussion of the Results

The result shows a significance difference on perception of the Earth as spherical between the two groups selected. 98% of Muslim geography students agree that the Earth is spherical with only one respondent (2%) disagreeing. Similarly, 78% of the respondents from the department of Islamic studies agree with the concept of spherical Earth while 22% disagree which is significant enough to make a difference statistically (Fig. 1). All the respondents from Department of Geography studied geography at their secondary school level whereas 67% of the respondents from Islamic Studies did so while the remaining 33% did not.



The finding above implies that the knowledge of geography is important in shaping the mind of individuals in comprehending the natural world. Prominent scholars like Ibn Hazm (994–1064 CE) and Ibn Taymiyyah (1263–1328 CE) affirmed on the Earth's sphericity citing both religious texts and astronomical evidence even though both believed in a geocentric model with the Sun revolving round the Earth which was the dominant viewpoint then due to the Ptolemaic influence (Anchassi, 2022). Certain verses of the Qur'an have been interpreted as alluding to

the Earth's rounded shape. For example, chapter 39, verse 5, mentions the Arabic word 'yukawwiru' which means the night is "wrapped" over the day and the day over the night denoting the action of coiling a cloth around a round object, like a turban, implying a continuous, overlapping change that only happens on a sphere (Buccaile, 1953). Furthermore, the word 'dahaha' in chapter 79 verse 30, often translated as "spread out," or "stretched out" has a root that can also carry connotations of making something egg-shaped (ostrich egg) which aligns with the Earth's true oblate spheroid shape (Anchassi, 2022).

Contrarily, other verses describe the Earth using words like "spread out" or "like a carpet", when taken literally and in isolation, can suggest a flat surface as in verses 2:22, 15:19, 20:53, 50:7, 51:48 and 71:19. Some modern historians still believe the Quran saw the world as flat citing commentators of the Qur'an such as Ibn Abbas, Jalalaini, Al-tabari, and Qur'tubi (Tabataba'i, & Mirsadri, 2016; Anchassi, 2022).

To resolve the abovementioned conflicting views, the 12th-century commentary by Razi argues that the above verses describe a flat surface which is limited in its application to local regions of the Earth which are roughly flat as opposed to the Earth as a whole (Anchassi, 2022). Proponents of the spherical Earth interpretation argue that such descriptions of the Earth as "spread out" or "stretched out" use phenomenological language describing the Earth as it appears to a human observer on the surface – lived or everyday experienced – because from a person's perspective on the ground, the Earth appears vast and flat for habitation, which does not contradict its overall spherical shape when viewed in its entirety. Therefore, the notion of a strictly "flat Earth" is a fringe belief that contradicts the established position of mainstream Islamic scholarship throughout history and in the present day (Afrizah & Novitri, 2024).

In the Qur'an, the words and phrases hinting at a spherical Earth are abstruse to the extent that one has to 'reason' or conduct a 'research' to figure it out whereas those hinting that the Earth is spread out or stretched out are very clear to the extent that without research or reasoning one can easily conclude that the Earth is flat. This suggests that natural phenomena can only be understood better through empirical evidence or reasoning, not through text, as the "signs" or "evidences" in nature are better understood by "people who use their reason" as stated in chapter 2, verse 164. This underscores the fact that reasoning is a tool of inquiry and scientific method.

If one is on the Earth's surface, one does not see the curvature of the Earth because of the planet's immense size relative to our human perspective and limited field of vision. The curve is subtle over short distance which is 58cm bulge across the 5.4km horizon (MacGregor, 2024). But, when a scientific enquiry is undertaken, evidences of the sphericity of the Earth become very obvious. In other words, a cursory examination reveals a 'flat earth' but a thorough examination or scientific approach reveals a 'spherical Earth' because the sphericity is hidden or abstruse. Therefore, the Qur'anic verses have similar import. When ones read the verses, one sees a flat earth; when one re-reads it with reasoning and close observation, one sees a spherical Earth.

For example, the translation of verse 33, chapter 22 by Al-Hilali & Khan (1978) reads: "And He it is, who has created the night and the day, and the Sun and the moon, each in an orbit floating (22:33)." A reader can easily conclude from the above translation that only the Sun and the moon are moving because there is no mention of the Earth in the verse. The same chapter and verse (22:33) translated by Ali (1938) reads: "It is He, who created the night and

the day, and the sun and the moon: *all (celestial bodies) swim along, each on its rounded course*". The transliteration of the clause in italic above is "kullun fi falakin yasbahuun." The "kullun" in the verse is a plural noun meaning three or more objects. Similarly, the verb "yasbahuun" is a plural one referring to more than two objects, which is why Ali (1938) included the celestial bodies that are not directly mentioned in the verse and parenthesized them. A scholar with knowledge of geography will perceive the above verse better as they will integrate the text (called *naql* in Arabic) with reasoning or scientific approach (called *aql*). Taking all things (text and reason) critically into consideration, the alternative translation will be: "And He is the One, who created the night and the day (the Earth), and the Sun and the moon, all (the three) moving on their orbits." One may ask, where does the Earth in parenthesis come from as it is not mentioned in the verse? The Earth is included into the translation because 'the night' and 'the day' are depicting the Earth as they (night and day) are not physical objects but phenomena without any orbit separate from that of the Earth. Therefore, night and day represents the Earth, implicitly, because they are "wrapped over the Earth" as we read earlier in this study. Since the Sun and the moon are spherical as we can physically see, we deduce from the verse that the Earth wrapped or coiled with night and day over it must be spherical through analogical deduction. This is a fact that we cannot grasp from the text alone without empirical method or critical thinking accompanied with knowledge of geography. So, if one looks at the Earth, one does not see its sphericity but through closer observation and measurement, the Earth is spherical as shown by the interpretation of the above verse from a geographic perspective. A further comparative study on rotation and revolution of the Earth will make this point very clear.

The intellectual tension in the subject stems from the conflict between the literal readings of divine text (*naql*) without complementing them with the verifiable data derived from observation and empirical science (*aql*). This study, therefore, puts forward the integration of *naql* and *aql* or respectively the phenomenological language cum scientific perspective as a complementary model to resolve the conflicting interpretation.

### **Conclusion**

The study found out that there is a statistically significant difference on perception of the Earth's shape between students of Islamic studies and Muslim geography students at the Kashim Ibrahim University, Maiduguri, Borno state which is attributable to their sub-sociocultural environment despite largely sharing the same physical and non-physical environments. Another reason could be because Muslim geography students have added advantage as they have integrated their learning experience in geography and that of their religion.

Secondly, despite the statistically perceptual variations between students of the two departments, the Qur'anic verses alluding to the shape of Earth as spherical are devoid of conflict among Medieval Muslim scholars as well as recent ones. In other words, there is a general agreement among Islamic scholars that the Earth is spherical despite the minority dissenting voice. The complementary nature of the Qur'an with geography is becoming glaring everyday as a result of the multilayered nature of the former by changing in meaning with time without any change in the manuscript.

Lastly, the study recommended that fostering true integration between Geography and Islamic Studies requires active collaboration through curriculum harmonization and development, addressing misconceptions through forums, collaborative research projects, co-teaching models for lecturers from the two departments to brainstorm and share their understanding of verses that are related to Earth's shape. Such collaborations and studies should also be extended to Tsangaya systems.

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